



Draft Tier 1 Environmental Impact Statement and Preliminary Section 4(f) Evaluation

Section 3.8, Noise

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1 **3.8 Noise**

2 This section describes potential traffic noise impacts that could result from implementing the
3 Build Corridor Alternatives. This section provides a summary of the noise evaluation, with
4 additional details included in the Draft Noise Report, which can be found in **Appendix E8**.

5 Noise is generally defined as unwanted or undesirable sound. Some of the most pervasive
6 sources of noise in the environment can come from transportation systems. Noise levels
7 decrease by about 3 to 4.5 decibels for each doubling of the distance from the source roadway.
8 Noise barriers along a highway are most effective for homes within about 300 feet of the
9 highway. Beyond that, noise barriers are less effective, but the natural decrease in noise with
10 distance usually reduces noise levels to acceptable levels. To provide some context for the
11 transportation noise levels provided in this chapter, noise levels associated with various types of
12 sound sources are summarized in **Figure 3.8-1** (Common Outdoor and Indoor Noise Levels).

13 Ground vibration, which can be a concern associated with the rail corridors, was not evaluated
14 as part of this Tier 1 analysis. There are no federal requirements directed specifically to highway
15 traffic induced vibration. All studies that highway agencies have completed to assess the impact
16 of operational traffic-induced vibrations showed that both measured and predicted vibration
17 levels are less than any known criteria for structural damage to buildings. In fact, normal living
18 activities (e.g., closing doors, walking across floors, operating appliances) within a building have
19 been shown to create greater levels of vibration than highway traffic. Vibration concerns are
20 addressed on a case-by-case basis as deemed appropriate in the noise analysis or in a stand-
21 alone vibration analysis report.

22 **3.8.1 Regulatory Setting**

23 The Federal Noise Control Act of 1972 (Public Law 92-574) requires that all federal agencies
24 administer their programs in a manner that promotes an environment free from noises that could
25 jeopardize public health or welfare. Federal Highway Administration (FHWA) assesses noise
26 impacts in accordance with 23 Code of Federal Regulations 772, *Procedures for Abatement of*
27 *Highway Traffic Noise and Construction Noise*. The noise evaluation conducted for the
28 Interstate 11 (I-11) Corridor is consistent with FHWA guidelines for assessing highway traffic
29 noise (FHWA 2011) and the most current version of Arizona Department of Transportation
30 (ADOT 2017) *Noise Abatement Requirements* (NAR), May 2017.

31 The 1964 Wilderness Act (Public Law 88-577) requires that natural sound and the visitor's
32 ability to experience it is a defined component of wilderness character. There are wilderness
33 areas in the Saguaro National Park (SNP) – West (near Options C, D, and Central Arizona
34 Project [CAP] canal).

35 **3.8.2 Methodology**

36 The Analysis Area for the noise evaluation consisted of the 2,000-foot-wide Project Area and
37 the immediately adjacent area extending a maximum of 1,000 feet away from the boundary of
38 the Project Area. The procedure used to evaluate noise impacts included the following steps:

- 1 1. Identify noise-sensitive land uses within the Analysis Area. Noise-sensitive land uses are
- 2 those which fall under Noise Abatement Criteria Land Use Categories A, B, C, and E in
- 3 **Table 3.8.1** (Noise Abatement Criteria).
- 4 2. Establish existing noise levels by utilizing noise measurements conducted for previous noise
- 5 studies throughout the I-11 Corridor dating between 2004 and 2015. New measurements
- 6 also were conducted in 2018 in some areas for which previous data was unavailable or
- 7 outdated. Previous noise measurements conducted within the past five years are still
- 8 considered valid for the purposes of this analysis. New measurements were taken in areas
- 9 where new roadways are proposed as well as noise-sensitive areas along existing roadways
- 10 that were not represented in the previously-collected data. Measurements were conducted
- 11 in accordance with the standards and guidelines established by FHWA (FHWA 1996).

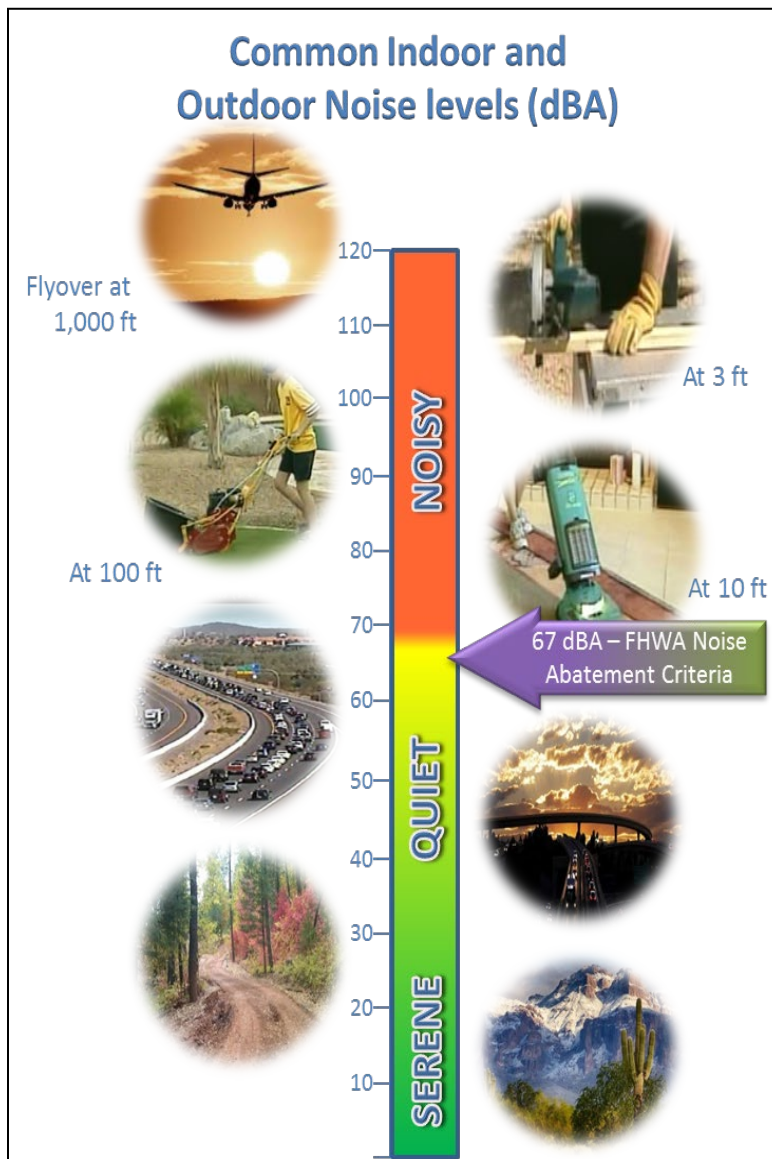


Figure 3.8-1 Common Outdoor and Indoor Noise Levels

1 3. Predict future (2040) noise levels using FHWA's Traffic Noise Model (TNM), Version 2.5. To
2 do this, the analysis methodology employed two approaches. The first more detailed
3 approach placed receivers at noise-sensitive land uses within the Analysis Area and
4 predicted future traffic noise levels at the receiver locations for each of the Build Corridor
5 Alternatives. Because specific roadway alignments are needed to build the TNM model
6 predicting future noise levels, the modeling evaluation for Options not co-located with an
7 existing highway used the typical cross sections (described in **Chapter 2**) placed at in the
8 center of the 2,000-foot-wide corridor. Because this analysis is intended to be a screening
9 level approach, a simplified model assuming flat earth with no terrain input was used. For
10 analysis of the Options co-located with existing facilities, TNM models developed for the
11 previous noise studies were used in combination with the assumed capacity improvements
12 (described in **Chapter 2**). The results of this detailed modeling are described in the attached
13 **Appendix E8**, Draft Noise Report.

14 The second more generalized approach using TNM 2.5 focused on predicting noise levels at
15 set distances from the edge of the right-of-way (ROW). The set distances consisted of 50,
16 100, 250, 500, and 1,000 feet. This approach utilized the same traffic volumes and typical
17 section assumptions as the more detailed analysis. The intent of modeling noise levels at
18 set distances was to provide representative noise levels that could be used to determine
19 noise levels at any sensitive land uses that fall within those distances. Modeling of the No
20 Build Alternative consisted of future traffic volumes moving at or five miles above the posted
21 speed limit, which represents free flow traffic conditions. This represents worst-case
22 scenario noise predictions, as congestion also would increase.

- 23 4. Determine areas where potential traffic noise impacts at noise-sensitive receivers are
24 expected to occur by comparing predicted noise levels in 2040 with the appropriate noise
25 abatement criteria (NAC), as shown in **Table 3.8.1**.
- 26 5. Describe where potential noise impacts could occur during construction of the Build Corridor
27 Alternatives.
- 28 6. Discuss noise mitigation strategies for those areas where noise impacts could potentially
29 occur.
- 30 7. Determine the zoning classification of vacant and undeveloped lands within the analysis
31 area to be made available to local planning agencies for their use in land-use planning. This
32 detailed inventory of vacant/undeveloped parcels and their zoning is available in the
33 attached **Appendix E8**, Draft Noise Report.

34 This evaluation represents a planning-level assessment based on generalized assumptions
35 regarding facility design (i.e., typical cross sections rather than specific roadway geometry) and
36 traffic information and other related assumptions available at the time of the analysis (December
37 2017). For example, the TNM 2.5 model runs for the Corridor Options that do not follow existing
38 roadways were based upon typical cross sections (available in **Appendix E1**) rather than
39 specific roadway geometry (which is standard procedure in a project-level traffic noise
40 evaluation and would be conducted during Tier 2 analysis). In the areas where a new road
41 would be constructed, a centerline was created in the middle of the 2,000-foot-wide corridor I-11
42 Corridor Study Area (Study Area). Details associated with Corridor Option co-location and
43 related construction footprint implications were deferred to the refined analyses anticipated
44 during the Tier 2 process. As the project proceeds and an alignment is identified during the
45 Tier 2 studies, additional noise analyses, including alternative noise sources such as nearby
46 railroads and airports, also would be required. The results of this analysis and the mitigation

1 considerations described should not be considered final; they will be verified and refined as the
2 design progresses.

3 **3.8.2.1 Noise Abatement Criteria**

4 NAC are used to define the noise levels that are considered an impact for each land use activity
5 category. If future noise levels approach or exceed the NAC, they are considered noise impacts
6 under ADOT’s NAR. ‘Approach’ is defined as noise levels within 1 decibel of the NAC. In
7 addition, a 15-decibel on the A-weighted scale (dBA) increase over existing noise levels is
8 considered a substantial increase in noise and would constitute an impact.

Table 3.8-1 Noise Abatement Criteria

Activity Category ⁽¹⁾	dBA Leq(h) ^{(2),(3)}	Common Indoor Noise Levels
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Residential.
C	67 (exterior)	Active sports areas, amphitheatres, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, churches, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, churches, public meeting rooms, public or nonprofit institutional structures, radio structures, recording studios, schools, and television studios.
E	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in categories A–D or F.
F	—	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	—	Undeveloped lands that are not permitted.

(1) Activity Categories B, C, and E include undeveloped lands permitted for each activity category.

(2) The 1-hour equivalent loudness in dBA, which is the logarithmic average of noise over a 1-hour period.

(3) The Leq(h) activity criteria values are for impact determination only, and are not design standards for noise abatement measures.

dBA = A-weighted decibels.

SOURCES: FHWA 2011; 23 Code of Federal Regulations 772.

9 **3.8.3 Affected Environment**

10 Noise sensitive land uses within the South Section (between Nogales and Casa Grande)
11 include residential, places of worship, schools, hotels, and parks/trails. Land uses in the Central



1 and North Sections primarily consist of scattered residences, agricultural land, industrial, and
2 undeveloped areas.

3 **3.8.3.1 Existing Noise Environment**

4 Measurements characterizing the existing noise environment were obtained from previous noise
5 studies within the project corridor as well as new noise measurements conducted for the I-11; all
6 noise measurements were conducted between August 2013 and August 2018 and are shown in
7 **Table 3.8-2** (Ambient Noise Monitoring Data).

Table 3.8-2 Ambient Noise Monitoring Data

Noise Monitoring Site # ⁽¹⁾	Previous Project or New Measurement	Date	Noise Level (dBA) ⁽²⁾	GPS Coordinates	Location Description
Mon 1	SR 189, International Border to Grand Ave ⁽³⁾	March 2016	53	31°22'3.51"N 110°56'43.84"W	Nogales High School near baseball field
Mon 2	New Measurement conducted for Draft I-11 Tier 1 EIS ⁽⁴⁾	February 2018	59	31°23'3.42"N 110°57'16.95"W	Near 2873 N Bitache Dr, Nogales, 85621
Mon 3			64	31°30'5.65"N 111° 0'41.49"W	East of 422 Gamino Agosto, Rio Rico, 85648
Mon 4			51	31°36'9.22"N 111° 2'59.46"W	Corner Post Way & Lombard Way, Tubac, 85646
Mon 5			55	31°48'44.87"N 111° 0'28.70"W	Behind 3994 S Via de Cristal, Green Valley, 85614
Mon 6	I-19 Noise Complaint Green Valley ⁽⁵⁾	July 2015	64	31°53'18.89"N 110°59'17.43"W	1222 N La Canoa, Green Valley- near Duval Mine Road
Mon 7	New Measurement conducted for I-11 Draft Tier 1 EIS ⁽⁴⁾	February 2018	63	31°57'45.01"N 110°59'21.54"W	Near 1130 W Vuelta Portillo Mesteno (Rancho Resort Community), Sahuarita, 85629
Mon 8			73	32° 8'35.38"N 110°59'9.80"W	966 W Mossman St, Tucson, 85706
Mon 9	Ajo Way (SR 86) Traffic Interchange (TI) ⁽⁶⁾	April 2014	70	32°10'1.91"N 110°59'5.45"W	Alley adjacent to residence at 4658 S 19th Ave
Mon 10			61	32°10'9.67"N 110°59'3.61"W	Near driveway to residence at 4525 S 19th Ave
Mon 11	Ajo Way (SR 86) TI	April 2014	71	32°10'13.12"N 110°59'6.15"W	On west side of privacy wall of residence at 942 W Macarthur St
Mon 12	Ajo Way (SR 86) TI	April 2014	68	32°10'14.98"N 110°59'11.22"W	Near driveway to residence at 1013 W Michigan St
Mon 13			67	32°10'27.73"N 110°59'12.18"W	Near driveway to residence at 1020 W District St
Mon 14			70	32°10'27.63"N 110°59'5.69"W	On west side of privacy fence of residence 926 W District St
Mon 15			60	32°10'30.46"N 110°59'3.78"W	Site in La Mar Park

Table 3.8-2 Ambient Noise Monitoring Data (Continued)

Noise Monitoring Site # ⁽¹⁾	Previous Project or New Measurement	Date	Noise Level (dBA) ⁽²⁾	GPS Coordinates	Location Description
Mon 16			64	32°10'35.25"N 110°59'12.52"W	Near driveway to residence at 1016 W Ebner Pl
Mon 17			58	32°10'37.26"N 110°59'0.99"W	West corner at property 851 W Ajo Way
Mon 18			63	32°10'38.03"N 110°59'16.50"W	Near driveway to residence at 3808 S Lamar Ave
Mon 19			52	32°11'24.19"N 110°59'3.01"W	In Paseo De Las Iglesias east of Cottonwood Ln
Mon 20	New Measurement conducted for I-11 Draft Tier 1 EIS ⁽⁴⁾	February 2018	60	32°12'28.98"N 110°58'37.14"W	Corner of S Osborn Ave & W 21st St, near 599 W 21st St, Tucson, 85701
Mon 21			59	32°14'34.84"N 110°59'7.84"W	1679 N Halron Ct, Tucson, 85705
Mon 22	I-10 Ruthrauf TI ⁽⁷⁾	December 2017	65	32°17'43.63"N 111° 1'44.88"W	4842 N Shannon Road
Mon 23			65	32°17'49.20"N 111° 1'50.13"W	4945 N Shannon Road
Mon 24			64	32°17'54.93"N 111° 1'54.49"W	5001 N Shannon Road
Mon 25			60	32°18'2.42"N 111° 2'1.00"W	Near 3051 Jade Place
Mon 26	I-10 Corridor Study, Tangerine Rd to Ina Rd ⁽⁸⁾	August 2013	67	32°20'43.58"N 111° 4'12.77"W	4902 West Massingale, Marana
Mon 27			60	32°21'22.81"N 111° 4'59.61"W	8221 N Cerius St, Marana
Mon 28			68	32°21'45.07"N 111° 5'18.48"W	Cortaro Ranch, undeveloped lot
Mon 29			63	32°21'58.84"N 111° 5'39.11"W	8815 Joplin Lane
Mon 30			57	32°22'1.80"N 111° 5'58.04"W	Marana Golf Continental Ranch
Mon 31			64	32°24'30.35"N 111° 8'25.02"W	111000 N Casa Grande Highway, Marana
Mon 32			72	32°24'59.76"N 111° 9'14.18"W	8800 N Frontage, Rillito
Mon 33			64	32°25'22.00"N 111° 9'32.10"W	A-Bar-A Recreational Vehicle Park
Mon 34	New Measurement conducted for I-11 Draft Tier 1 EIS ⁽⁴⁾	February 2018	39	32°18'42.17"N 111°15'19.57"W	SNP-Near 12900 Sweetwater Dr, Tucson, 85743
			40	32°18'42.17"N 111°15'19.57"W	SNP-Near 13500 W Mustang Rd, Tucson, 85743

Table 3.8-2 Ambient Noise Monitoring Data (Continued)

Noise Monitoring Site # ⁽¹⁾	Previous Project or New Measurement	Date	Noise Level (dBA) ⁽²⁾	GPS Coordinates	Location Description
Mon 35a	New Measurement conducted for I-11 Draft Tier 1 EIS ⁽⁴⁾	August 2018	43	32°15'46.21"N 111°14'7.26"W	SNP – near 12690 W Fort Lowell Rd, Tucson 85743
Mon 35b			46	32°15'13.38"N 111°13'0.36"W	SNP – NE corner of W Mile Wie Rd & N Sandario Rd at Campsite
Mon 35c	SNP, Discovery Trail ⁽⁹⁾	2016	39	32°15'37.30"N 111°12'36.90"W	SNP – Discovery Trail
Mon 36	Picacho_2017_Draft Noise Report ⁽¹⁰⁾	April 2017	56	32°43'5.81"N 111°29'51.91"W	Picacho School Playground
Mon 37	New Measurement conducted for I-11 Draft Tier 1 EIS ⁽⁴⁾	February 2018	68	32°46'59.23"N 111°37'39.32"W	3400 N Outer Dr, Eloy, AZ 85131
Mon 38			48	32°51'0.22"N 111°51'35.23"W	South of SKP Co-OP Retreat Mobile Home Park -SE corner W Selma Hwy & S Montgomery Rd, Casa Grande, 85193
Mon 39			60	32°50'1.30"N 112° 7'53.19"W	Within Saguaro-One Recreational Vehicle Park-52725 West of I-8 Frontage Rd, Maricopa, 85139
Mon 40			48	32°57'24.39"N 112° 7'48.49"W	NE Corner of W Teel Road and N Johnson Road, Maricopa, 85139
Mon 41			55	32°56'34.61"N 112°41'16.50"W	South end of the Mobile home park near S Butterfield Tr & S Main St, Gila Bend, 85337
Mon 42			49	33°20'39.17"N 112°28'8.60"W	19478 W Corto Lane, Buckeye, 85326
Mon 43			52	33°21'18.28"N 112°39'12.80"W	27935 W Hazen Rd, Buckeye, 85326
Mon 44			41	33°29'21.23"N 112°49'45.70"W	36032 W Weldon Ave, Tonopah, 85354
Mon 45			50	34° 2'35.76"N 112°50'28.12"W	22275 W El Grande Trl, Wickenburg, 85390

- (1) Monitoring site numbers correspond to labels in the figures attached in **Appendix E8**.
- (2) Equivalent sound level.
- (3) ADOT 2016.
- (4) New measurements were conducted by the I-11 Tier 1 EIS study team between February and August 2018. Full details of these measurements are provided in **Appendix E8**.
- (5) ADOT 2015.
- (6) ADOT 2014.
- (7) ADOT 2017.
- (8) ADOT 2013.
- (9) Job 2016.
- (10) ADOT 2017.

dBA = A-weighted decibels, EIS = Environmental Impact Statement, I-10 = Interstate 10, I-19 = Interstate 19, SNP = Saguaro National Park, SR = State Route, TI = Traffic Interchange.

1 Noise measurement data obtained from previous noise studies dating from 2013 to 2018 range
2 39 dBA to 73 dBA. Measured noise levels ranged from 39 dBA (near SNP) to 72 dBA (near I-19
3 in South Tucson). In general, measured noise levels were consistent with the prevailing land
4 uses, with higher noise levels in the more urban areas and lower noise levels in rural areas.

5 Local airports also are a contributing factor to the existing noise environment. Disturbance from
6 aircraft noise can be greater in areas with low background noise than in urban areas. There are
7 several airports within the Study Area, including Buckeye Municipal Airport, Marana Regional
8 Airport, Palm Valley Tucson Airport, Pinal Airpark, and the Tucson International Airport. Further
9 discussion and graphical representation of nearby airports and Study Area noise monitors can be
10 found in **Appendix E8**.

11 In consideration of noise effects on the SNP, the frequencies, magnitudes, and durations of
12 acceptable levels of unnatural sound may vary throughout a park, and are generally greater in
13 developed areas, which are adjacent to the observed corridors. Natural sounds may form a
14 valued part of the visitor experience. Conversely, the sounds of motor vehicle traffic, an electric
15 generator, or construction equipment can greatly diminish the solemnity of a visit to a national
16 memorial, the effectiveness of a park interpretive program, or the ability of a visitor to hear a bird
17 singing its territorial song. Additionally, culturally appropriate sounds are important elements of
18 the national park experience in many parks, and soundscape resources and values of the parks
19 are fundamental components of the purposes and values for which the parks were established.
20 It is essential to minimize all noise that through frequency, magnitude, or duration affects the
21 natural soundscape or other park resources or values, or that exceeds levels that have been
22 identified as being acceptable to or appropriate at the sites, including the course of construction
23 activities. More detailed noise analyses of the SNP will be completed in future Tier 2
24 environmental reviews.

25 **3.8.4 Environmental Consequences**

26 **3.8.4.1 Build Corridor Alternatives**

27 The goal of the traffic noise analysis was to determine the total number of receptors where
28 future noise levels would be expected to approach or exceed the applicable NAC, potentially
29 warranting consideration of noise-abatement measures during Tier 2 National Environmental
30 Policy Act evaluations. The noise modeling evaluation focused on noise-sensitive land uses or
31 active, permitted residential developments within 1000' of the ROW. TNM 2.5 loses prediction
32 accuracy as the receiver is located farther away from the noise source. The results of this
33 detailed noise analysis are contained in the Draft Noise Report in **Appendix E8**, which includes
34 a detailed table and corresponding map of all receiver locations where noise impacts may
35 potentially occur. The results of the more generalized noise analysis, conducted at set distances
36 meant to be representative, are summarized below.

37 Constructing roads causes a substantial amount of temporary noise. Noise during construction
38 could be a nuisance to nearby residents and businesses. All three Build Alternatives would
39 generate similar types of noise that would occur sporadically in different locations throughout
40 the construction period. For all projects, ADOT will consider the effects of noise from project
41 construction activities and will determine any additional measures that are needed in the plans
42 or specifications to minimize or eliminate adverse impacts from construction noise.

43 As a general matter, new highway alignments constructed in otherwise quiet noise
44 environments, such as those in the undeveloped areas of the corridor, will often result in a



1 substantial noise increase at nearby residences (that is, 15 dBA or greater increases over
2 existing noise levels). Under such circumstances and depending on the number of residences
3 affected, detailed consideration of noise barriers during Tier 2 analyses would be warranted.

4 Noise modeling results for the Build Alternatives are described in **Table 3.8-3** (Summary of
5 Predicted 2040 Traffic Noise Levels). Future traffic noise impacts are predicted at a majority of
6 the modeled noise receiver locations within the Analysis Area as described in more detail in
7 **Appendix E8**. Under the Purple Alternative, noise impacts would generally occur within 100 feet
8 of the ROW, but potential impacts would occur out to 250 feet along Option G. Under the Green
9 Alternative, noise impacts are predicted to occur at most locations within 100 feet of the ROW.
10 Under the Purple and Green Alternatives, noise levels 1,000 feet away from I-11 are predicted
11 in the range of 40 to 50 dBA, which would not exceed the FHWA NAC for any land use
12 categories. Traffic volumes are directly related to modeled noise level predictions; higher traffic
13 volumes result in higher noise levels.

14 Noise impacts for the Orange Alternative are likely to occur at noise sensitive land uses within
15 250 feet of the edge of the ROW. Potential impacts would occur out to 500 feet along some of
16 the Options co-located with existing facilities (Option B).

17 Similar to the Purple and Green Alternatives, most noise-sensitive land uses within the Analysis
18 Area are expected to experience potential noise impacts. Noise abatement would need to be
19 evaluated at a number of locations under all three Build Corridor Alternatives. Due to the density
20 of the noise-sensitive land uses along the Orange Alternative, this Alternative has the highest
21 number of locations where noise abatement would potentially be warranted, subject to further
22 study in Tier 2 analyses. All three alternatives may have similar numbers of modeled noise
23 sensitive receiver locations; however, the Orange Alternative would most likely have more
24 receptors (the number of dwelling units represented by a receiver location) compared to the
25 receivers in the Green and Purple Alternatives. While the other Build Corridor Alternatives would
26 likely see similar numbers of impacted receivers and warrant mitigation in some of those
27 locations, the development along the Orange Alternative close to the co-located facility is much
28 more dense in comparison to the more rural areas surrounding the Purple Alternative and
29 Green Alternative. Noise abatement measures can include noise walls, reduced speeds, and
30 truck traffic restrictions.

31 In addition to the screening evaluation which modeled noise levels at set distances described
32 above, noise levels also were predicted at several parks and recreation areas. **Table 3.8-4**
33 (Summary of Predicted 2040 Traffic Noise Levels at Major Parks and Recreation Areas)
34 presents the distance to the point along the park/recreation area boundary closest to the Option
35 cited as well as the predicted noise level at that boundary location. These noise levels are
36 provided for planning purposes only; because the receiver point was placed at the closest point
37 along the park boundary, the noise levels represent a worst-case scenario for noise levels at the
38 location within the park where highway noise levels would be loudest. In addition, the approach
39 to this screening level analysis consisted of a simplified noise model assuming flat earth, with no
40 elevation or terrain input. During the Tier 2 analysis, a project-level noise impact evaluation will
41 identify exterior areas of frequent human use, such as a picnic area or visitors center, and
42 require development of more detailed noise models with terrain and elevation inputs.



Table 3.8-3 Summary of Predicted 2040 Traffic Noise Levels

Option	Distance From Edge Of Right-of-Way				
	50'	100'	250'	500'	1000'
Purple Alternative					
A	70	68	63	58	52
C ⁽¹⁾	67	65	61	57	51
G	74	72	67	62	56
I1	70	69	65	60	54
I2	70	68	64	60	54
L	67	65	62	57	51
N	71	69	65	61	55
R	70	69	65	60	54
X	61	59	55	50	44
Green Alternative					
A	70	68	63	58	52
D ⁽²⁾	55	53	49	44	38
F	69	67	63	58	52
I2	70	68	64	60	54
L	67	65	62	57	51
M	65	64	60	55	49
Q2	70	69	65	60	54
R	58	56	52	48	43
U	70	68	63	58	52
Orange Alternative					
A	70	68	63	58	52
B (portion along I-19)	79	76	71	66	60
B (portion along I-10)	78	77	72	66	60
G	74	72	67	62	56
H	67	65	61	56	49
K	67	65	61	56	49
Q1	64	62	58	53	47
Q2	65	64	60	55	49
Q3	78	75	70	65	59
S	62	61	57	52	46

⁽¹⁾ Noise levels predicted for Option C are representative of noise levels for both Option C along Sandario Road and Option C with the CAP Design Option.

⁽²⁾ Noise levels predicted for Option D are representative of noise levels for both Option D along Sandario Road and Option D with the CAP Design Option.

1-10 = Interstate 10, I-19 = Interstate 19.

- 1 The noise modeling evaluation focused on areas of active, permitted residential development.
- 2 Under ADOT NAR, permitted developments are those locations where a commitment to develop
- 3 land was issued in the form of a site development plan and the issuance of building permits.

Table 3.8-4 Summary of Predicted 2040 Traffic Noise Levels at Major Parks and Recreation Areas

Alternative/ Option	Description	Approximate Distance From Edge Of Corridor (Feet)	dBA
Orange/B	SNP	7,884	45
	Tucson Mountain Park	8,890	42
Purple/C	SNP	1,600	46
	Tucson Mountain Park	5,970	40
	Ironwood Forest National Monument (NM)	5,965	40
Green/D	Ironwood Forest NM	5,965	37
Central Arizona Project (CAP) Design Option	SNP	1,600	
	Tucson Mountain Park	400	
Green/F	Ironwood Forest NM	574	43
Orange/H	Sonoran Desert National Monument (SDNM)	50	78
Purple and Green/I2	SDNM	14,078	39
Orange/K	SDNM	50	78
Purple/L	SDNM	500	61
Green/M	SDNM	2,820	44
Purple/N	SDNM	3,921	46
Orange/Q1	SDNM	2,310	42
Orange/S	Proposed Vulture Mountains Recreation Area (VMRA)	50	74
Green/U	Proposed VMRA	50	71
Purple/X	Proposed VMRA	50	71

CAP = Central Arizona Project, dBA = A-weighted decibels, NM = National Monument, SDNM – Sonoran Desert National Monument, SNP – Saguaro National Park, VMRA = Vulture Mountains Recreation Area.

- 4 Option A, Option B, and Option G are co-located with existing facilities which have a parallel
- 5 railroad. Options L, R, S, U, and X cross railroad corridors. Railroad corridors may be considered
- 6 as an alternative noise source and would need to be considered in the Tier 2 noise analyses.
- 7 The CAP Design Option comes slightly closer to the boundary than the Sandario Road
- 8 Alignment with negligible difference in noise levels and impacts. Option C comes closer to the
- 9 boundary of the SNP in its northern extents, but the distances are approximately 3,770 feet and
- 10 meaningful effects at those distances to the park are highly unlikely.



1 In all Build Corridor Alternatives under consideration, noise levels 1,600 feet from the highway
2 are not likely to exceed 60 dBA at any location in the SNP; however, there may be potential
3 impacts due to a substantial increase in noise levels (15 dBA or more). Noise measurements
4 were taken at two residential areas near the park in February 2018; the noise levels ranged from
5 39 to 40 dBA. Two additional measurements were taken within the SNP boundary in August
6 2018; the noise levels ranged from 43 to 46 dBA. Option B (Orange Alternative) follows the
7 existing alignment of I-10 and would not result in any meaningful changes to the park that would
8 require additional analysis.

9 **3.8.4.2 No Build Alternative**

10 Under the No Build Alternative, I-11 would not be constructed. Land uses would remain
11 undeveloped or agricultural until development occurs as planned by local jurisdictions. There
12 would be no changes in future traffic noise associated with I-11 although noise levels along
13 existing transportation facilities throughout the Study Area would likely increase due to the
14 projected population growth and the accompanying increased future traffic volumes. As shown in
15 **Table 3.8-5** (Summary of Predicted 2040 Traffic Noise Levels – No Build Alternative), noise
16 levels exceeding the NAC would potentially occur at most noise-sensitive land uses within
17 500 feet.

**Table 3.8-5 Summary of Predicted 2040 Traffic Noise Levels –
No Build Alternative**

Option	Distance From Edge Of Right of Way				
	50'	100'	250'	500'	1000'
I-19 (Nogales to Sahuarita)	85	82	73	66	58
I-19 (Sahuarita to I-10)	88	84	77	69	62
I-10 (I-19 to Marana)	92	89	82	74	66
I-10 (Marana to I-10)	88	84	76	69	61
I-8 (I-10 to Gila Bend)	82	78	69	62	55
SR 85 (Q1, Gila Bend to Buckeye Hills)	79	75	66	60	53
SR 85 (Q2, near Buckeye Hills)	84	81	72	65	58
SR 85 and I-10 (coincident with Option Q3)	88	84	75	68	60

I-8 = Interstate 8, I-10 = Interstate 10, I-19 = Interstate 19, SR = State Route.

18 **Summary of the Potential Impacts of the Build Corridor Alternatives**

19 Predicted 2040 traffic noise levels at most of the noise-sensitive land uses within the Analysis
20 Area would experience potential noise impacts under all of the Build Corridor Alternatives
21 (**Table 3.8-6** [Summary of the Potential Noise Impacts of the Build Corridor Alternatives] located
22 at the end of this section). The potentially impacted receivers are shown in **Appendix E8**.
23 Generally, noise impacts could be expected to occur at noise-sensitive land uses within 100 feet
24 of the edge of the ROW. For all of the alternatives, noise impacts could extend up to 500 feet.
25 Under the Green and Purple alternatives, noise impacts could extend out to a greater distance
26 into National Park, NM, and designated wilderness areas due to the relatively low existing noise
27 levels. As a general principle, new highway alignment constructed in a quiet or undeveloped area
28 (e.g., Option C, Option D, and Option F) will typically result in a substantial increase of 15 dBA or



1 greater which would warrant the consideration of noise mitigation. Project-level analysis
2 identifying noise impact locations would occur during Tier 2 analysis, which would include a full
3 evaluation of noise mitigation.

4 **3.8.5 Potential Mitigation Strategies**

5 Traffic noise levels can be mitigated by a variety of abatement measures, such noise barriers,
6 earthen berms, refinement of horizontal and vertical alignments, reduced speeds, and truck
7 traffic restrictions. ADOT NAR has specific requirements for analyzing the feasibility,
8 reasonableness, and cost-effectiveness of noise-abatement measures. The abatement
9 evaluation requires specific design details that are not yet available for I-11. As a result, a
10 detailed barrier evaluation is not possible at this preliminary stage of the project.

11 As described in Section 3.8.4.2, Residential Developments (Activity Category B Modeling),
12 expected noise impacts were identified at most of the noise-sensitive land uses. Noise barriers
13 would likely be warranted for the Build Corridor Alternatives as follows:

- 14 Purple Alternative: Options A and B
- 15 Green Alternative: Options A and B
- 16 Orange Alternative: Options A, B, and G

17 FHWA and ADOT will identify specific mitigation measures during the Tier 2 processes.

18 A goal of this noise study is to identify areas that may be impacted by traffic noise. Using traffic
19 projections, noise levels were predicted at specific distances to provide the best estimation of
20 future noise levels in the vicinity of the Build Corridor Alternatives. Undeveloped lands within the
21 Study Area have been identified and categorized based on zoning, and are documented in
22 **Appendix E8** of this Draft Tier 1 EIS. This information would be available to local and regional
23 jurisdictions for their use in planning noise-compatible land uses in the vicinity of I-11 in the
24 future.

25 **3.8.6 Future Tier 2 National Environmental Policy Act Noise Analysis**

26 This evaluation is based on limited design and traffic information and presents preliminary
27 model results. Certain assumptions were made to complete the noise analysis. In areas where a
28 new road would be constructed, a centerline was created at the existing grade in the middle of
29 the 2,000-foot-wide corridor Project Area. As the design for the project is developed further and
30 alignments are refined or eliminated, additional noise analyses will be required.

31 For the Tier 2 Analysis, updated noise measurements will need to be conducted throughout the
32 entire corridor, especially in rural areas where a substantial noise increase (a 15-dBA increase
33 over existing noise levels) would be likely. Detailed noise modeling will be conducted in
34 accordance with the standards, procedures, and guidelines in place when the Tier 2 studies
35 commence.

36 Options B and G are co-located with existing I-19 and I-10 and also have a railroad parallel to
37 the existing highway; those may be considered as an alternative noise source and need to be
38 included in Tier 2 noise analyses.

Table 3.8-6 Summary of the Potential Noise Impacts of the Build Corridor Alternatives

Topics	Alternatives			
	No Build	Purple	Green	Orange
Potential Noise Impacts	No changes in future traffic noise associated with I-11; noise impacts predicted to occur in areas up to 500 feet from existing ROW due to projected population growth and the accompanying increased future traffic volumes.	Noise impacts predicted to occur in areas up to 250 feet from ROW, some impacts up to 500 feet.	Noise impacts predicted to occur in areas up to 250 feet from ROW.	Noise impacts predicted to occur in areas up to 250 feet of ROW, some impacts up to 500 feet. More locations potentially warranting noise mitigation due to density of surrounding development.
Indirect Effects	Programmed transportation improvements plus projected population and employment growth could: <ul style="list-style-type: none"> Continue to follow the trend in increasing noise levels, which are already exceeding FHWA Noise Abatement Criteria (NAC) in certain locations. 	Land development and the affiliated increase in traffic induced by the project could: <ul style="list-style-type: none"> Alter the soundscape in areas that have lower existing ambient noise conditions. Potentially reduce noise levels through mitigation measures on existing infrastructure in the South and Central Sections where improvements are made. Increase noise levels for cultural/historic and recreation resources. 	Similar to the Purple Alternative.	Similar to the Purple Alternative, except: <ul style="list-style-type: none"> Noise levels potentially increase in areas where there is an existing transportation use in the South and Central Sections.

Table 3.8-6 Summary of the Potential Noise Impacts of the Build Corridor Alternatives (Continued)

Topics	Alternatives			
	No Build	Purple	Green	Orange
Indirect Effects (Con't)	<ul style="list-style-type: none"> Increase the noise levels affecting biologic resources in areas that are currently not developed 			
Cumulative Effects	Past, present, and reasonably foreseeable projects could: <ul style="list-style-type: none"> Potential incremental increases in noise levels in communities as population growth occurs. 	Past, present, and reasonably foreseeable projects could: <ul style="list-style-type: none"> Increase noise levels and the associated effects in communities surrounding the corridor. 	Similar to the Purple Alternative.	Similar to the Purple Alternative.

FHWA = Federal Highway Administration, NAC = Noise Abatement Criteria, ROW = right-of-way.



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